Saml N. Hamilton

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#8

Of Phosphorus as a remedy in diseases.

Before commencing a detail relative to the medical properties of Phosphorus, it will not, perhaps, be amiss to give a short account of its chemical history.

Phosphorus is said to have been discovered by one Brandt, a citizen of Hamburg, in his researches for the philosophers stone. The process of preparing it was kept as a profound secret for a long time, till discovered by the celebrated Boyle, who promulgated it to the world, and claimed the right and honour of its discovery.

It would be unnecessary for me to enter into a minute account of its character or chemical history, as all that I could say, has already been elaborately detailed by almost every chemical writer. However, the following short account of its external characters, and chemical preparation, are taken from different chemical authors.

Phosphorus is an inflammable substance, and is known by the following external characters.

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It has generally a flesh red colour, but, when carefully purified, may be obtained free from colour, and perfectly transparent. Its specific gravity is 1.77.

It is so soft that it readily yields to the knife. It melts at about 90° Farenheit, and boils at 550°. When melted, it must be covered with water, in order to prevent it from inflaming.

In the atmosphere it emits a white smoke and peculiar smell; and a faint and beautiful light arises from it; but those appearances do not take place in air artificially dried.

Phosphorus is inflamed by the application of a very gentle heat. According to Dr. Higgins, a temperature of 60° is sufficient to set it on fire, when perfectly dry. It burns when heated to about 148°, with a brilliant light, a white smoke and a suffocating smell.

It may be set on fire by friction. Rub a very small bit between two pieces of brown paper; and the phosphorus will inflame, and will set the paper on fire also.

Phosphorus may be obtained from various substances, both animal and vegitable; tho' most commonly from bones and urine, but in greater abundance from the former. The process

for procuring it are also numerous.

The following process which is most commonly employed, I presume, is simplest, most expeditious, and from which a greater abundance of the article is obtained.

Take a quantity of bones of adult animals, burn them to whiteness in an open fire, and reduce them to a fine powder. Upon three pounds of this powder, after having been put into a matrass, there may be poured three pounds of concentrated sulphuric acid of commerce; four or five pounds of water must be afterwards added by degrees to assist the action of the acid. The whole is then to be left in a gentle heated sand bath, for about twelve hours, or more, taking care to supply the loss of water which happens by vaporation. The next day a large quantity of water must be added, the clear water afterwards decanted, and the rest strained through a cloth or sieve. The residuary matter is to be edulcorated by repeated effusions of hot water, till it passes tasteless. The whole fluid gradually vaporated in a flat earthern basin, to the consistence of syrup. It is then to be mixed with an equal weight of charcoal powder, and submitted to distillation in an iron or earthern retort. Instead of applying a receiver,

the neck of the ~~receiver~~ retort may be immersed in a basin of water, to a small depth, and the phosphorus as it comes over, will fall in drops to the bottom.

In this process, the sulphuric acid unites with the calcareous earth of the bones, and forms sulphate of lime; and the phosphoric acid of the bones becomes disengaged, and remains dissolved in the liquor. The charcoal at an elevated temperature takes the oxygen from this acid, and carbonic acid gas is formed; and phosphorus passes over.

The application of phosphorus to the cure of disease, I believe, is not of very long date.

It was first used as a medicine in particular diseases by the French. But on account of its violent action on the system, which generally occurred even in the minutest dose, and which was not easily restrained, and the fatal effects it occasionally produced, it was either universally abandoned, or held as an unruly and dangerous remedy.

After a considerable time it was again revived in England, and like most new and powerful medicines it promised fair, during the enthusiasm of the moment, under the genial warmth of medical probation, to become a powerful and

valuable remedy in many intractable diseases. But unfortunately its existence was of short duration, or, at least, it shared pretty nearly the same fate as it did on its first appearance.

A long lapse of time now succeeded in which it was sunk into oblivion, or heard nothing of as a medicine. But about 20 years ago the attention of the medical world was again excited to this medicine; when the medical ~~works~~ journals of Europe teemed with communications of its undoubted medical virtues in various diseases. "It was extensively employed in the French military hospitals in low fevers and with a view of checking gangrene from wounds &c. Nearly at the same time the physicians of different countries seemed to have been busily engaged in experimenting with it in the diseases already mentioned, and also, in the whole of the nervous and spasmodic affections, to which may be added, gout and Rheumatism, dropsy, amenorrhoea, impotency, uterine hemorrhages, and finally, in arresting the effects of the mineral poisons, as lead, arsenic &c."*

Phosphorus like other powerful medicines requires caution in its administration, for an improper or disproportionate dose, produces dangerous

* Dr. Chapman's Therap: & Mat: Med:

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Phosphorus is universally described to be a quick and diffusible stimulus, pervading the whole system in a few hours after its administration, even in the minimest doses; "invigorating the circulation, augmenting animal temperature, promoting the secretions, particularly of the skin and kidneys, imparting force to the muscles, bracing the nerves, inflaming venereal desire, and arousing the mind to animation and hilarity."*

Several experiments have been made with phosphorus both on the human and animal subjects.

A Mr. Lavoi made an experiment upon himself; he swallowed three grains of phosphorus with some theriaca. It was a wonder, says he, that I was not killed by it; for phosphorus does not require more air than what is contained in the stomach, in order to take fire, and burn in such a manner as to have eaten through that organ. For two hours, he observes, I found myself extraordinarily incommoded; I drank frequently little draughts of cold water. After some hours had elapsed the uneasiness ceased. My urine was high coloured; but the following day my muscular force was redoubled.

Dr. Chapmans Therap: & Mat: Med:.

and I felt an insupportable venereal irritation.

The magnitude of this dose and not to produce more fatal consequency, is almost incredible; but as it appears to come from respectable authority, and our insufficiency of knowledge with this article, it would be unjust either to deny or affirm it.

Dr. Weikard made several experiments on dogs, to one of which he gave six grains of phosphorus. Soon after he began to run about the room, exhibiting much anxiety, and seemed desirous to go out. He grew sick and vomited the boles, which seemed to be on fire; upon this, the dog appeared impatient to get out. The smell of the phosphorus, however, ceased to be emitted by the vomited matter. The dog, smelt it again, and ate it. He immediately became extremely lively, springing from one table to another. Another piece of meat containing eight grains of phosphorus, was thrust down his throat, he again vomited it on fire; he did not, however, exhibit the same anxiety to leave the room, which he had done on the first time, but waited patiently, till the disagreable fume which arose and filled the apartment, had escaped from his mouth, after which he ate it greedily. His inclination to leap and run about was more

uncommonly great; nothing was too high or too distant for him; but as we were afraid he might do some injury by this kind of exercise, he was dismissed the apartment. He again vomited once or twice; but since that time has remained perfectly well.

It is evident, that this enormous dose of phosphorus, would have inevitably distroyed this animal, had he not immediately vomited it up, and on coming in contact with the atmosphere it ignited ~~before~~ and was nearly, or completely consumed, before he swallowed the balls a second time.

Professor Chapman states, that during his residence in Edinburg, aided by his friend Dr. Dewche, he made several experiments on rabbits, and was led to conclude, that the strong excitement created in these animals, was of a painful nature, and marks of inflammation, were uniformly observed in the alimentary canal after death. And contrary to what has been said, he was unable to perceive that the venereal appetite was in the least increased, the most sensible effect was a constant and prodigious discharge of urine.

I dissolved three grains of phosphorus in one ounce

of Sulphuric Ether. Of this, assisted by friend and fellow-student Mr. Benj.n C. Glover, I gave a dog about sixty drops; he remained perfectly quiescent for about thirty minutes, when I repeated the dose. Soon after he appeared anxious to get out, and exhibited symptoms of great uneasiness, and was seized with a kind of singultus; he remained in this condition for about forty minutes, when he vomited a quantity of white and very tough or viscid froth; he vomited several times afterwards, which appeared to be nothing more than the contents of his last meal mixed with a little froth. After this he became quite tranquil and appeared to have entirely recovered. He remained perfectly free from any apparently unpleasant symptom for three or four hours, when I gave him another dose. Soon after he again grew sick, and vomited several times a quantity of the same viscid froth, as he had done in the commencement. He had none of that inclination to leap and run about, as the dog manifested in the experiment of Dr. Wickard.* I kept him in confinement for twenty-four hours after the last dose was given, when I dismissed him apparently well. He could not have taken less than 1/12 gr. of phosphorus, at the least calculation.

Many formulæ have been recommended

* Nor did he void any unusual quantity of urine, nor could I perceive that his venereal appetite was in the least increased.

in the administration of phosphorus; but according to Professor Lobstein of Strasburg, in his monography on phosphorus, it appears, that the vehicle in which the article is most completely dissolved and its unpleasant taste and ill effects disguised and prevented, is Sulph: Ether. By this article, he asserts, that the caustic property of phosphorus is changed into a reviving and analeptic substance. He further asserts, that by the addition of a small quantity of distilled aromatic oil, that not only the efficacy of the remedy is improved, but it is also more easily preserved; and to prevent its decomposition, it should be given in a little syrup, or on a lump of sugar.

A very good process is to rub it down with sweet almonds, or gum arabic, and then add a portion of Spts: Nitre Dulc:, Hoffman's anodyne liquor, Sulph: Ether &c. making the whole into an emulsion, by which its taste and odour are disguised.

It has been recommended also, to melt it in hot water, to reduce it to powder by constantly shaking, till its solidity is restored, and to triturate this powder, after having divested it of its humidity, with oil and sugar, or the yolk of an egg.

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form it is a dangerous remedy. Given in oil, as is most commonly done, it is exceedingly nauseous, and is scarcely ever retained on the stomach, if not a dangerous prescription.

"Respecting the precautions necessary in the administration of phosphorus, Professor Lobstein makes the following remarks. "One grain of phosphorus," says he, "I have been taught by experience is quite sufficient to be taken during the twenty four hours; beginning with small doses, and gradually increasing them according to symptoms;" (about 1/10 or 1/12 of a grain at a dose.)

"The phosphorus agrees better, and can be borne in a larger dose, when the air is dry and clear than in cold and rainy weather. It ought never to be taken on an empty stomach, but always an hour after the patient has taken some nourishment; solid and acid food, and drink in general, even beer, is improper. To quench the thirst, a mucous solution of salep, with sweet and generous wine, is the best beverage; the patient must also refrain from drinking immediately after having taken the phosphorus.

"In acute diseases, when there is commonly but little appetite, broth with a little mutton, or vermicelli, sago &c. may be taken; but, in chronic disorders when digestion is not impaired, veal, fowl and mutton,

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either boiled or roasted, fowls, snipes, hares, as also light vegitables, such as carrots, French beans, &c. are a fit diet. Cabbage, turnips, onions, radishes, rape, cole, peas &c. must be avoided, causing a sensation of fulness in the region of the ~~region~~ of the stomach, together with anxiety, insupportable heat, and often vomiting and diarrhœa. The food must neither be taken too hot nor too cold, fruit and milk are to be prohibited.

"In case the patient can go out, it is of great importance to be on his guard against catching cold, which is apt to occasion vertigo, and diarrhœa, or a relapse. Convalescents should wear a flannel shirt next to the skin; the warm bath agrees also very well with persons taking phosphorus, particularly in disorders of the nervous system, but they must stay above a quarter of an hour in it."

As phosphorus is universally admitted to be one among the most powerful stimuli, we would be induced to conclude, a priori, that it is a valuable medicine in all low and nervous diseases, when the vital powers, are almost exhausted by disease, and other debilitating causes, as malignant & typhus fever &c.

In such cases, I believe the phosphorus has been mostly employed, and in which it has displayed its best effects.

Professor Lobstein mentions three cases of typhus fever in the last stages of exhaustion, where other remedies proved ineffectual, to have been radically cured by phosphorus. He also states to have cured a peripneumonic patient in the last stage of debility by this article. A tertian fever resisting all the most powerful remedies usually employed in similar cases was cured by this remedy. A periodical cephalalgia, and a chronic gouty complaint, wandering about in the body, was cured by it: menstruation, suppressed by catching cold was restored by the use of this remedy combined with the tincture of cinnamon.

In looking over the definition of Phosphorus, in the the latest American edition of Quincy's Lexicon Medicum, I observed twelve cases related to have been succesfully treated by phosphorus; which are translated from a medical Thesis of one Dr. Wolff, who graduated at Gottingen, in the year 1791, and who states that these cases were extracted from the private diary of his father, a physician of eminence in Poland.

As these cases are very interesting, inasmuch as they point out the particular diseases, or states of diseases, in which the article

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has proved so astonishingly beneficial, and as they appear to be taken from the journal of a distinguished practitioner of long and extensive experience, I hope it will not be trespassing on your patience one or more of them.

He states to have been called to a woman about 25 years of age, whom he found in a low state of delirium. Her pulse was small, weak and tremulous, almost vanishing, as it were, under the finger. Her whole chest and arms were disfigured with livid spots. Her neighbours and attendants informed me, says he, that she had been seized with a fever of a very violent kind about eleven days before I saw her, and that her attending physician finding his remedies ineffectual, had deserted her, declaring that God alone could cure her.

Her case appeared to me, continues he, to be one of those desperate states of disease, in which a practitioner ought to refrain from doing anything, or to make trial of some new, bold, and powerful remedy, which might act as an uncommon stimulus to the nerves, and rouse their suppressed energy. Such a remedy I expected to find in phosphorus, and accordingly I ordered my patient five drops of a solution, in ether, which contained three grains of

phorus. They were exhibited in a spoonful of Rhenish wine, and the patient swallowed a few cupfuls of an infusion of tilia after them. In the course of three hours afterwards, finding no change in my patient, I repeated the dose. Two hours were scarcely elapsed when the pulse began to rise, and the body to be diffused with an equal heat; immediately afterwards the pulse became undulatory, a breathing sweat, (sudor halituosus) broke out, and at the same time, the delirium subsided.

I exhibited a third dose at the end of sixteen hours; a number of red spots then appeared on the skin, and the patient complained very much of a sense of oppression and pain about the precordia, and in the abdomen. These symptoms I endeavoured to allay by diluent and frequent emollient clysters, which brought away a great quantity of foul fæces. The Dr. Bath completed the cure.

Another case was of a young lady, who a short time after delivery, by a sudden fright was seized with a chilly fit, succeeded by ~~chilly~~ flushes of heat, accompanied with delirium. The pulse was tremulous, and intermittent, cold extremities, and wandering in her intellects. She was treated with the phosphorus as in the other case, and

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A young man of a putrido gastric fever accompanied with a white miliary eruption, while under a profuse perspiration, was exposed to cold, soon after he was seized with great anxiety, the eruptions almost totally disappeared, and he began to grow delirious; he was also cured by phosphorus.

A youth of a putrid fever, accompanied with a diarrhoea of so severe a kind, that he had forty eight stools in the course of a day. His countenance was hippocratic, attended with subsultus. He was also cured by this article.

Professor Chapman, in his annotations on Burns' midwifery, states that he had used phosphorus in one case of amenorrhoea, attended with a general torpor of the system, accompanied with a low degree of temperature; but its use was interrupted too soon, by the prejudices of the patient, to judge of its efficacy. He gave ⅛ of a grain intimately blended with olive oil. Even in this small dose it produced an universal glow and excitement. However, he believes, that when well regulated, phosphorus is both a safe, and eminently useful remedy.

My particular friend and fellow student,

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Mr Mitchell, whose veracity and talents, both as medical and scientific, are entitled to the highest respect and confidence, informs me that on a voyage to the East Indies, acting as physician and surgeon to the ship's crew, being somewhat circumscribed with regard to medicines, he was obliged to use phosphorus in the cases of intermittent fever, in all of which he accomplished a speedy and radical cure. In one case, however, arterial action was excited to so high a degree that he was forced to use the lancet pretty freely. He gave it a few hours before the expected paroxysm, and always completely suspended it or mitigated its violence.

As a dernier resource, does not phosphorus promise to do good in many diseases attended with a general atony of the system, or even of particular parts? Under the same circumstances, does it not promise to do good in many of the nervous diseases, as paralysis, epilepsy, chronic mania &c?—